Air Force Civil Engineer Center



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WILLIAMS AIR FORCE BASE

Site LF004 Landfill Remedial Action

BCT Conference Call 16 July 2020



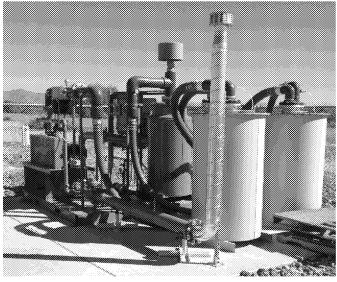
LF004 Recent and Upcoming Activities

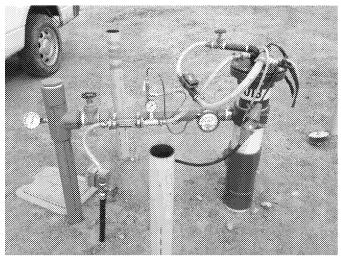
- Draft 2019 landfill inspection report submitted 25 Jul 2020.
- Conference call with ADEQ and EPA was held on 7 July 2020 to discuss AF response to ADEQ comments regarding SVE and IWAS decommissioning. ADEQ to provide list of SVE wells and VMP locations that require sampling.
- Validation of semi-annual (May 2020) analytical data in progress



Site LF004 LF01-W17 Area IWAS System Update

- Preliminary May 2020 PDB results indicate all monitoring wells below the TCE MCL with the exception of LF01-W17S (9.3 μg/l), LF01-W17M (5.8 μg/l) and LF01-W30M (10 μg/l)
- Previous Nov 2019 PDB for LF01-W17S (7.9 μg/l), LF01-W17M (3.8 μg/l), and LF01-W30M (10 μg/l)
- Monitoring wells upgradient and downgradient of LF01-W17S, LF01-W17M, and LF01-W30M are below TCE MCL
- Additional oxidant injections performed 16 June 2020. Oxidant measured postinjection (120 mg/l at W17S; 75 mg/l at W17M; 95 mg/l at W30M).



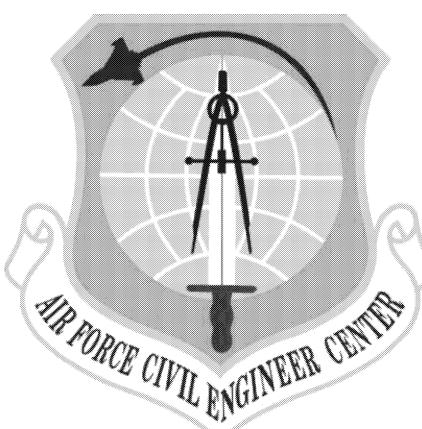




Site LF004 Southern Area SVE and Oxidant Injection

- Preliminary May 2020 PDB results indicate only four PCE MCL exceedances at two locations: W19S at 8.6 μg/l (dup 9.4 μg/l),
 W19M 10 μg/l (dup 10 μg/l), W24S at 6.7 μg/l and W24M at 8.8 μg/l
- Previous November 2019 PDB results for W19S at 7.8 μ g/l (dup 8.2 μ g/l), W19M 4.3 μ g/l (dup 4.1 μ g/l), W24S at 4 μ g/l and W24M at 6.2 μ g/l.
- Oxidant injections performed 16 June 2020. Oxidant measured post-injection (155 mg/l at W19S; 152 mg/l at W19M; 145 mg/l at W24S; 152 mg/l at W24M).
- Upgradient wells in the vicinity of W19 and downgradient wells in the vicinity of W24 are below the PCE MCL

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Site FT002
Fire Training Area Remedial
Action

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Site FT002 Update

- AF approved keeping the DEUR in place Nov 2018
- Draft Explanation of Significant Differences (ESD) document to add the land use control to the ROD has been revised per legal comments in June 2020
- Revised Final Remedial Action Completion Report submitted
 22 Nov 2019
- Received EPA comment letter on 31 Dec 2019. Received ADEQ comments on 12 Feb 2020. Response to comments under internal AF review.

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Site SS017
Old Pesticide/Paint Shop

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Site SS017 Groundwater Monitoring Update

- Draft Q4 (Nov) 2019 annual report submitted for regulatory review 27 Apr 2020
- Draft Q1 (Feb) 2020 data summary report in preparation
- Draft Q2 (May) 2020 report in preparation
- Q3 2020 sampling will occur in August



Parcel K-1-2 Property Transfer

- Final FOST signed by the AF 29 May 2020
- AF preparing assignment package
- AF to request ADEQ to prepare draft DEUR once assignment package is complete

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Site ST012
Former Liquid Fuel
Storage Area

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Site ST012 Outline

- Summary of activities since June BCT call
- LNAPL removal summary (no new data)
- Update on benzene and sulfate concentrations
- Pilot study extraction/injection update
- Preliminary SIP results
- Path forward



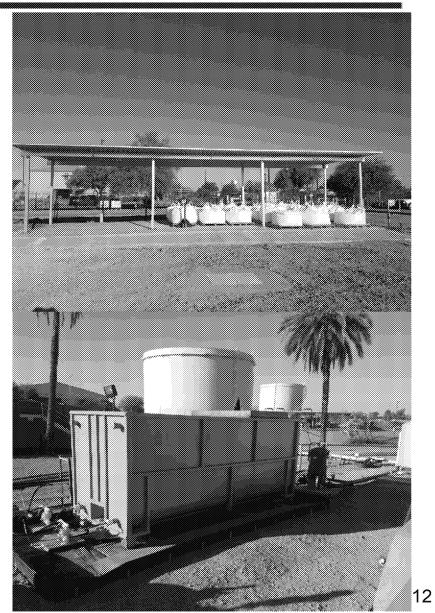
Site ST012 Activities Since June

SVE Rotation on 9 Jul 2020, current status:

- Extraction wells: SVE01S, SVE01M, SVE02M,
 SVE03M, SVE07D, SVE09S, and SVE14(M)
- Venting wells: SVE01D, SVE03S, SVE03D, SVE04M, SVE07S, SVE07M, SVE11(M), and SVE13(M)
- Closed wells: SVE02S, SVE02D, SVE04S,
 SVE04D, SVE05S, SVE05M, SVE05D, SVE06S,
 SVE06M, SVE06D, SVE08S, SVE08M, SVE08D,
 SVE09M, SVE09D, SVE10(M), and SVE12(M)

Pump Repairs

- UWBZ21 continued with limited pumping due to high temperatures
- CZ07 motor replaced
- Pumps removed from UWBZ22 and LSZ28 to facilitate injections

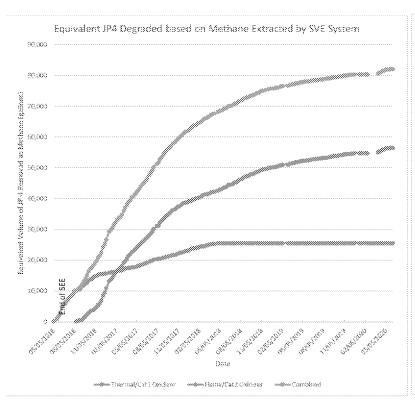


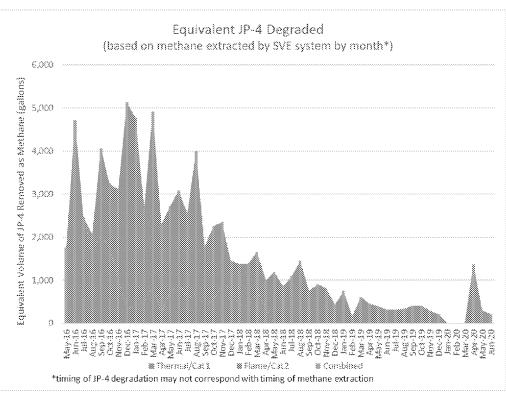


JP-4 Degradation Based on Methane Removed with SVE



Site ST012 SVE System Equivalent JP-4 Degradation Based on Methane Removed





- Estimates through 25 June 2020
- Estimated JP-4 degradation as methane is in addition to JP-4 removal reported for SVE
- Thermal/Cat1 oxidizer changed from SVE to groundwater treatment end of Apr 2018 (low methane concentrations recently observed but attributed to vapor bleed through closed valve from SVE)
- Flame oxidizer treating combined SVE and air stripper intermittently in Nov 2018 Jan 2019
- Flame oxidizer replaced by catalytic oxidizer (Cat2) 7 Feb to 26 Feb 2019



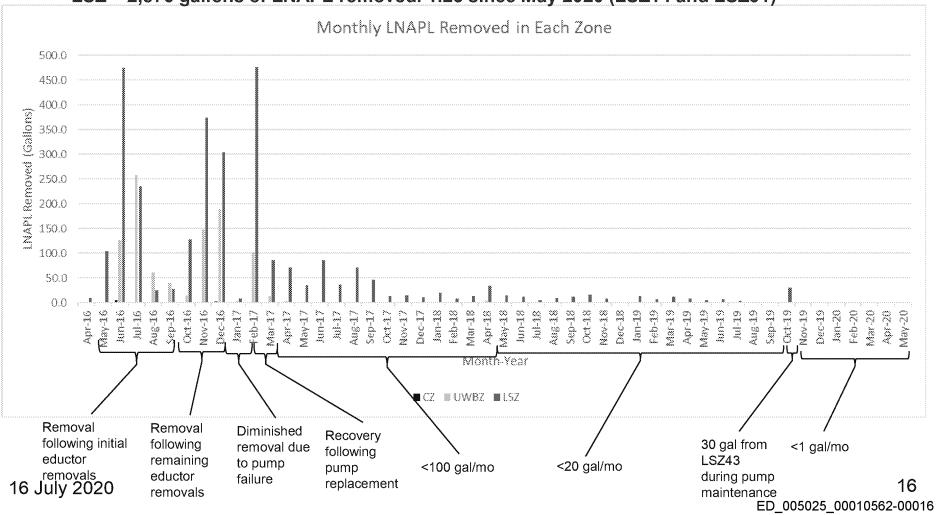
LNAPL Removal Summary

16 July 2020 15



ST012 LNAPL Removal Summary

- CZ 7.75 gallons of LNAPL removed. None since Feb 2020
- UWBZ 963 gallons of LNAPL removed. None since Apr 2019
- LSZ 2,876 gallons of LNAPL removed. 1.25 since May 2020 (LSZ14 and LSZ31)





Preliminary Second Quarter Groundwater Sampling Results

16 July 2020



Sampling Summary

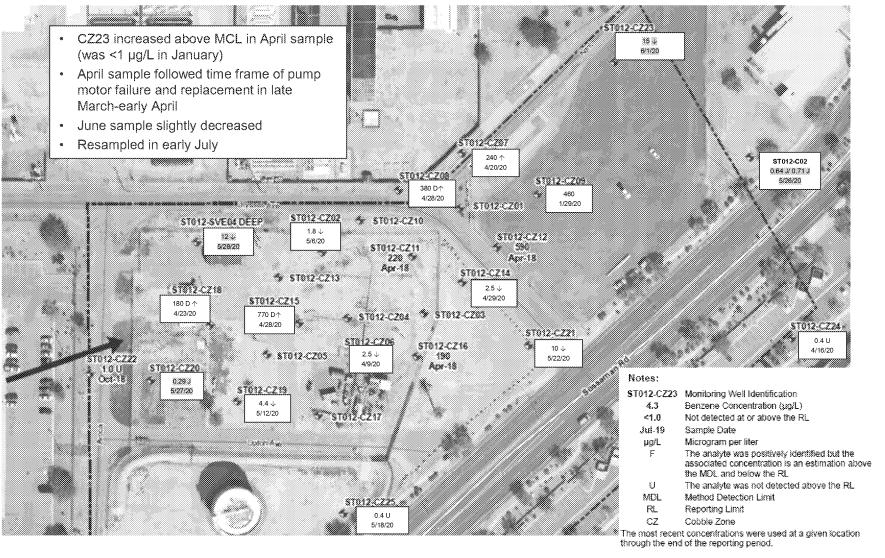
Sampling includes:

- Extraction Wells
- Injection Wells (where injections took place)
- Monitoring Wells (in areas where injections took place)
- Perimeter Wells

16 July 2020



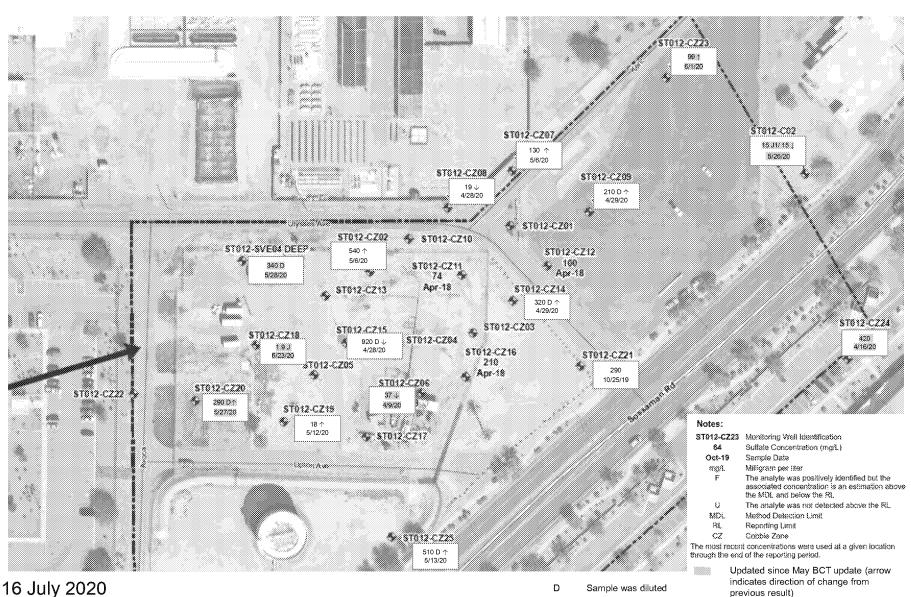
Site ST012 Benzene (µg/L) in CZ for Q2 2020



Updated since May BCT update (arrow indicates direction of change from previous



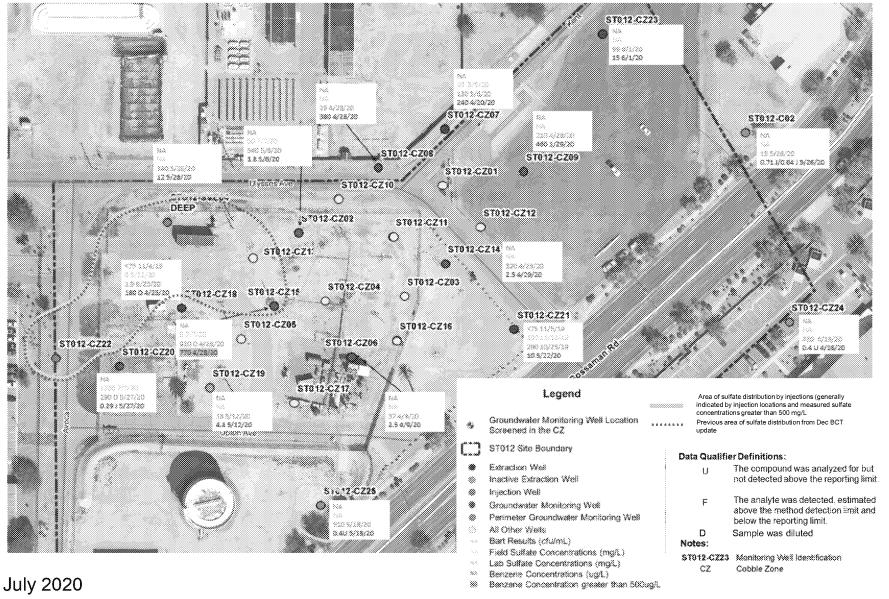
Site ST012 Sulfate (mg/L) in CZ for Q2 2020



20

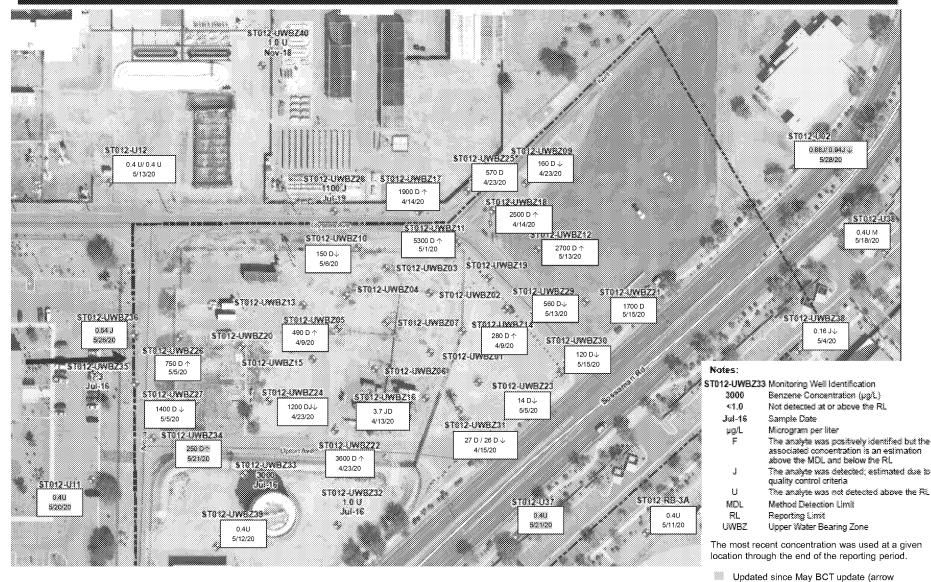


EBR Treatment Area in CZ for Q2 2020





Site ST012 Benzene (µg/L) in UWBZ for Q2 2020



16 July 2020 D Sample was diluted

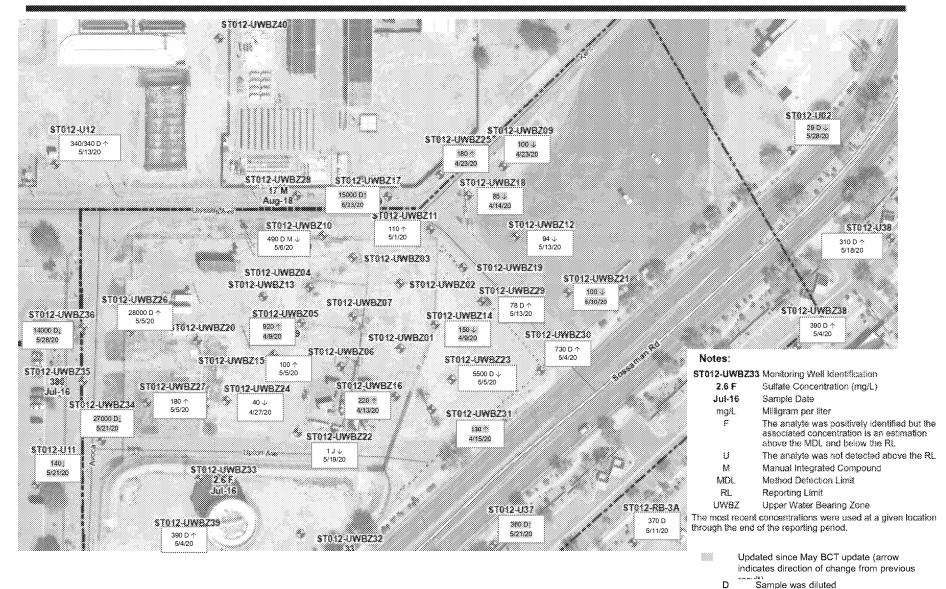
Updated since May BCT update (arrow indicates direction of change from previous result)

ED 005025 00010562-00022

22



Site ST012 Sulfate (mg/L) in UWBZ for Q2 2020

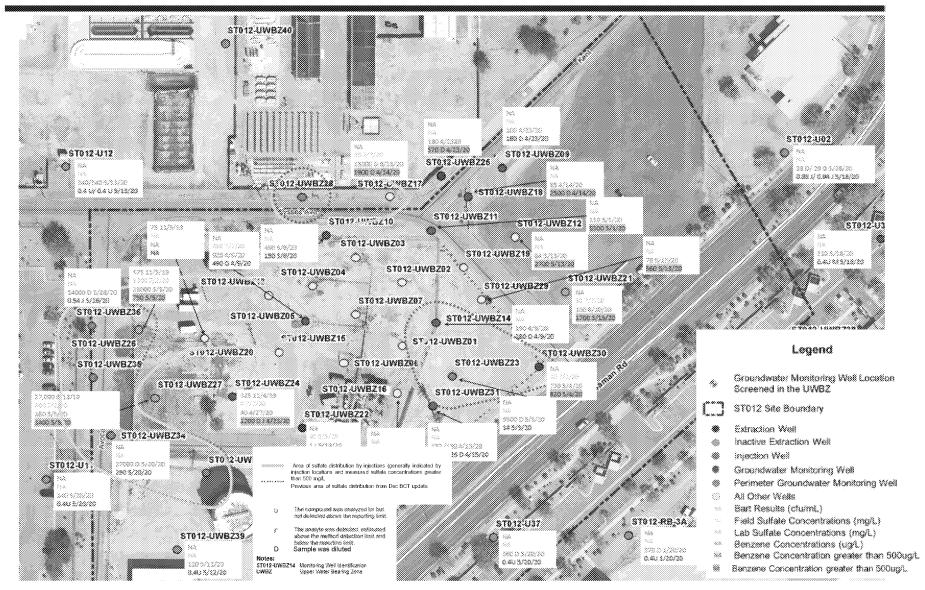


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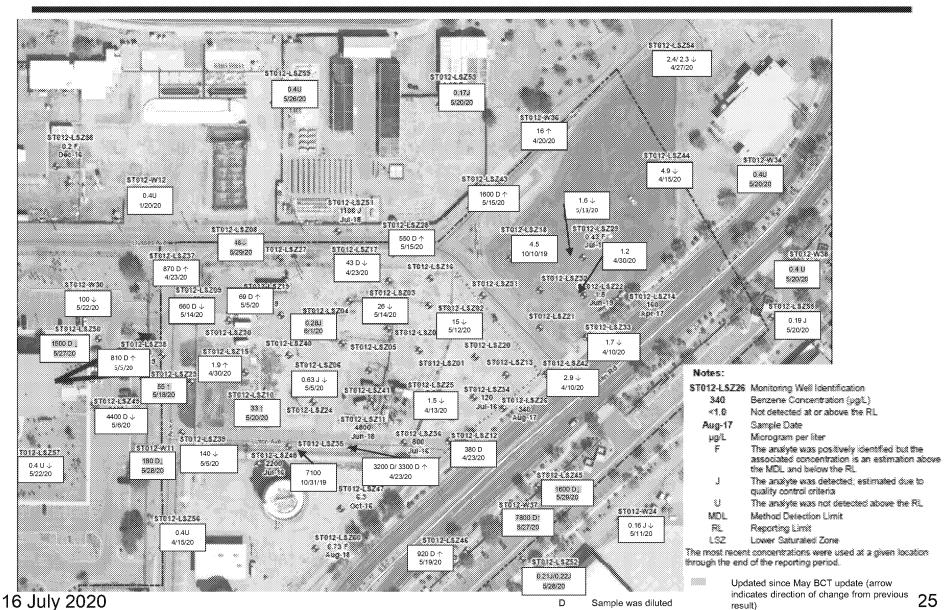
EBR Treatment Areas in UWBZ for Q2 2020



16 July 2020



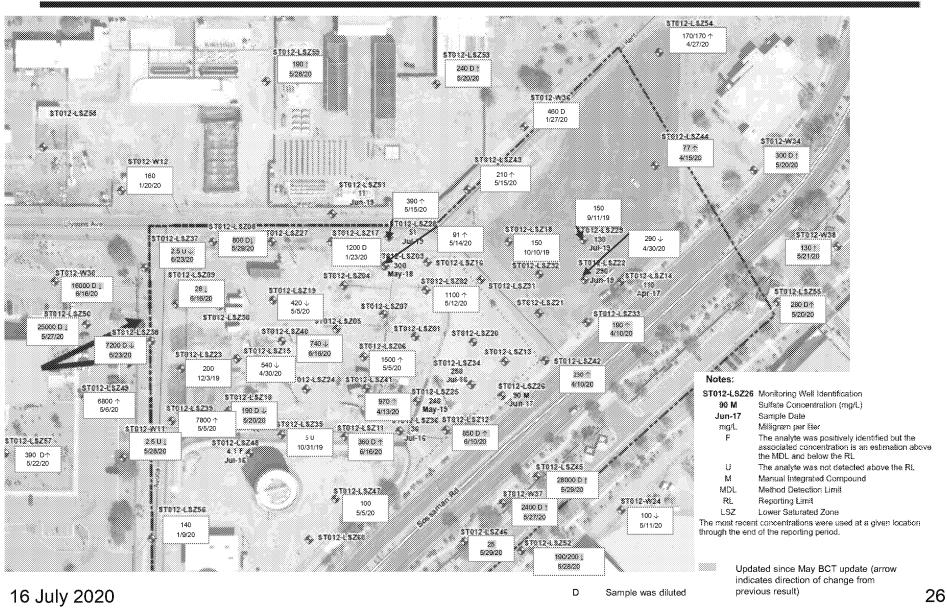
Site ST012 Benzene (µg/L) in LSZ for Q2 2020



ED_005025_00010562-00025

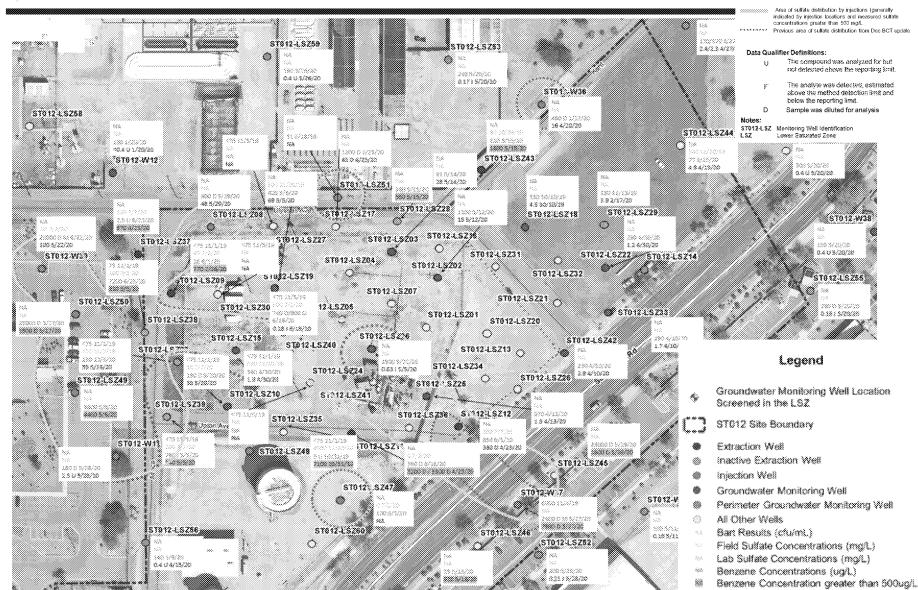


Site ST012 Sulfate (mg/L) in LSZ for Q2 2020





EBR Treatment Areas in LSZ for Q2 2020



16 July 2020

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Analysis for Benzene Degraders



Site ST012 Biological Testing

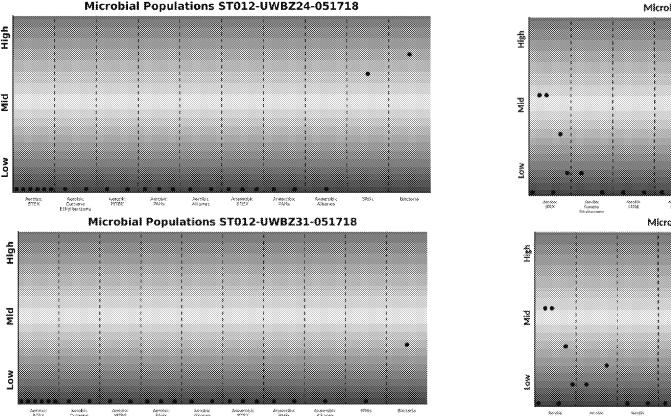
- First set of BioTraps® pulled out from UWBZ26, UWBZ27, LSZ38, and LSZ39 on 30 Mar 2020
- Second set of BioTraps® pulled out from UWBZ26, UWBZ27, LSZ38, and LSZ39 on 20 Apr 2020
- QuantArray®-Petro analysis results received
- C¹³ results received
 - Dissolved inorganic carbon (DIC); 5-week and 8-week results
 - Phospholipid fatty acids (PLFA); 5-week and 8-week results

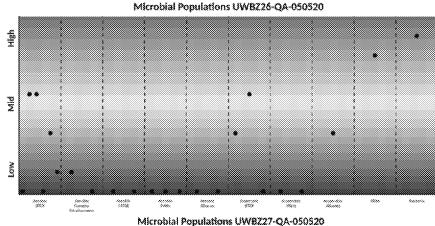


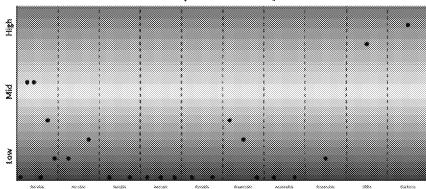
Site ST012 Biological Testing-QuantArray®-Petro - UWBZ

Wells evaluated in 2018 and 2020







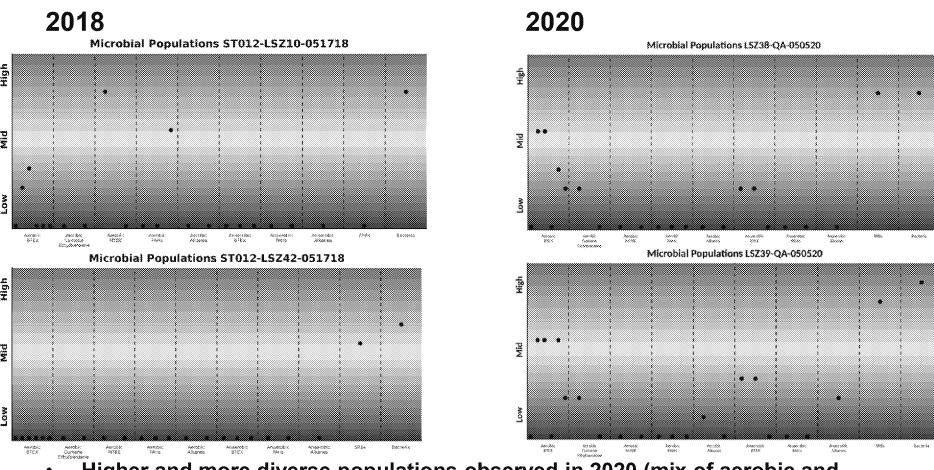


 Higher and more diverse populations observed in 2020 (mix of aerobic and anaerobic markers for petroleum degraders)



Site ST012 Biological Testing-QuantArray®-Petro - LSZ

Wells evaluated in 2018 and 2020



 Higher and more diverse populations observed in 2020 (mix of aerobic and anaerobic markers for petroleum degraders)



Site ST012 Biological Testing for C¹³ PLFA (Overview)

- PLFA are found in the cell membranes and breakdown rapidly upon cell death so PLFA analysis appropriate for evaluation of live biomass
- Biotraps initially contained benzene with higher C¹³ content than found in natural environments.
- C¹³ content in PLFA of biomass in retrieved biotraps compared to natural environmental (average background)

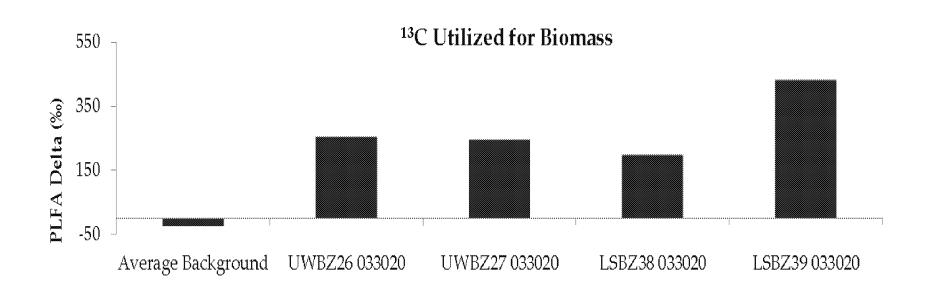
16 July 2020



Site ST012 Biological Testing Results for C¹³ PLFA (Week 5)

Microbial Insights Finding:

"Quantification of 13 C-enriched PLFA conclusively demonstrated that benzene was metabolized under existing site conditions. The average PLFA δ^{13} C value in all four wells fell within the moderate range, indicating 13 C-labeled benzene was incorporated into microbial biomass."

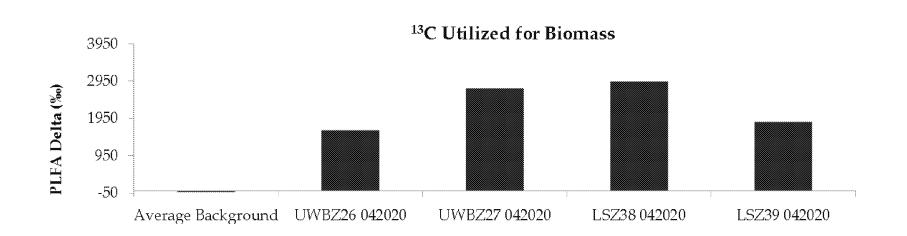




Site ST012 Biological Testing Results for C¹³ PLFA (Week 8)

Microbial Insights Finding:

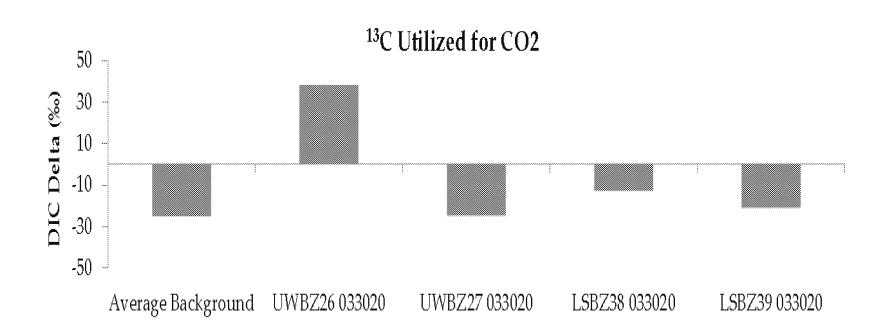
"Quantification of 13 C-enriched PLFA conclusively demonstrated that benzene was metabolized under existing site conditions. The average PLFA δ^{13} C value in all wells was between 1,600% and 3,000%, indicating a high level of incorporation of 13 C-labeled benzene into microbial biomass."





Site ST012 Biological Testing Results C¹³ DIC

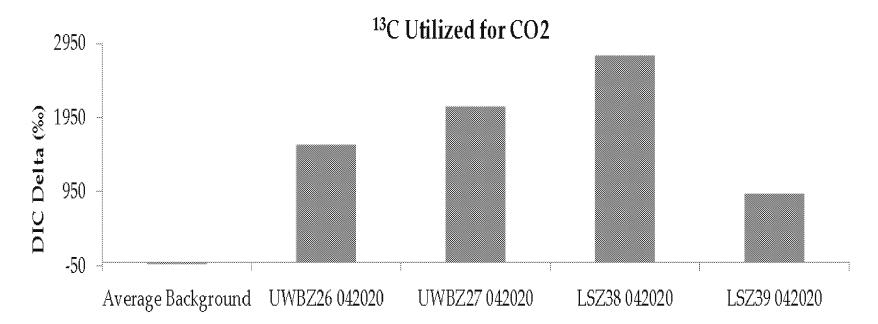
- DIC analysis evaluates microbial conversion of C¹³ for energy
- C¹³ content not significantly enriched in DIC at 5 weeks. Per Microbial Insights, even low levels of enriched DIC provides conclusive evidence of contaminant biodegradation





Site ST012 Biological Testing Results C¹³ DIC (contd)

 C¹³ content enriched greater than 1,000 fold in DIC at 8 weeks indicating a high rate of utilization and conclusive evidence of contaminate biodegradation.





Pilot Study Injection/Extraction Update

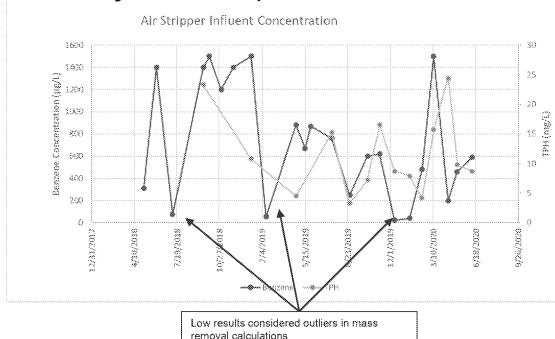


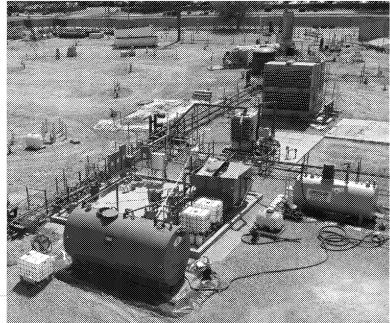
Extraction Well	Calculated Average Extraction Rate in Period gpm	Maximum Temperature Since May 2018 °F	Most Recent Temperature °F	Cumulative Extraction Since May 2018 gallons	Note					
ST012-CZ07	0.0	175	132	5,481,175	Motor failed but has since been replaced					
ST012-CZ18	Off	136	126	3,019,867	Extraction stopped due to sulfate presence (Oct 2019)					
ST012-CZ19	NA		103		Eliminated as an extraction well by FVM#7					
ST012-CZ21	0.0	150	115	452,498	Pump shut down due to low concentrations.					
ST012-CZ23	4.2	114	102	1,064,416						
CZ Subtotal				10,017,957						
ST012-UWBZ21	19.3	178	175	638,328	Submersible installed but only runs for a few minutes/day (high temp)					
ST012-UWBZ22	0.00	146	110	482,384	Shutdown due to slow recharge rate and pump removed (June 2020)					
ST012-UWBZ25	4.2	168	161	1,205,906						
ST012-UWBZ26	Off	133	114	2,408,709	Extraction stopped due to sulfate presence (Sep 2019)					
ST012-UWBZ27	Off	128	94	130,011	Extraction stopped due to sulfate presence (May 2019)					
ST012-UWBZ30	Off	172	128	2,527,610	Shutdown due to sulfate presence (May 2020)					
UWBZ Subototal*				8,661,381						
ST012-LSZ09	Off	140	130	2,748,461	Extraction stopped due to sulfate presence (Oct 2019)					
ST012-LSZ11	0.0	141	90	6,370,661						
ST012-LSZ12	6.3	130	98	3,510,077						
ST012-LSZ23	Off	113	94	3,638,934	Extraction stopped due to sulfate presence (Aug 2019)					
ST012-LSZ28		162	165	23,131	Pump removed to faciltate injections					
ST012-LSZ29	NA	>170		17	Eliminated as an extraction well by FVM#7					
ST012-LSZ37	NA	132	90	6,706,323	Extraction stopped to avoid pulling sulfate from BioTrap locations					
ST012-LSZ38	Off	160	90	941,898	Extraction stopped due to sulfate presence (Aug 2019)					
ST012-LSZ39	Off	92	78		Extraction stopped due to sulfate presence (May 2019)					
ST012-LSZ43	0.0	150	140	1,585,251						
ST012-UWBZ28/LSZ51	NA	146	128		Extraction stopped (Aug 2019), changed to injection end of subphase 2					
W36	NA	81	81		Only used for make up water for sulfate mixing					
LSZ Subtotal*				28,044,120						
Total of Wells	34.0			47,110,073						
Treatment System	39.1			38,396,517						
Data is preliminary * Includes 1/2 of ST012-	UWBZ28/LSZ51									

16 July 2020



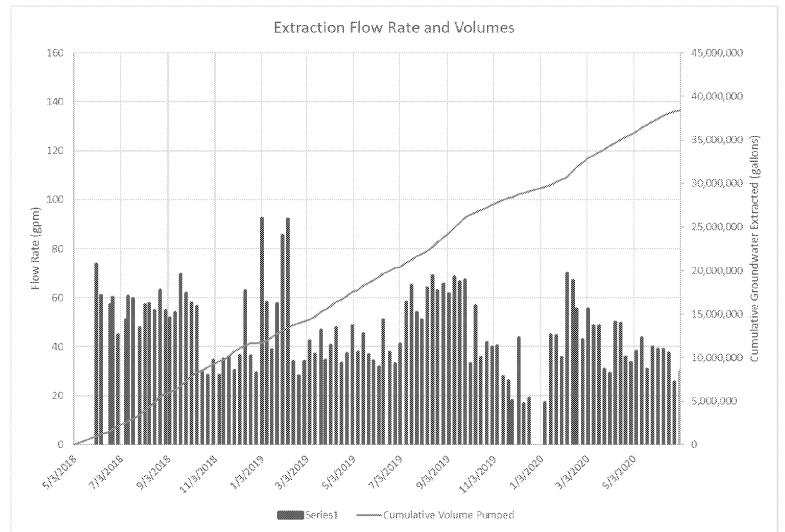
- No LNAPL has been recovered since extraction started up
- Extraction pumps UWBZ21 pumping intermittently.
- UWBZ22 removed to facilitate injection.
- CZ18, CZ21, UWBZ26, UWBZ27, UWBZ30, LSZ09, LSZ23, LSZ29, LSZ37, LSZ38, and LSZ39 turned off due to sulfate presence
- Benzene air stripper influent increased to 590 µg/L for June sample (July not yet available). TPH concentration decreased.





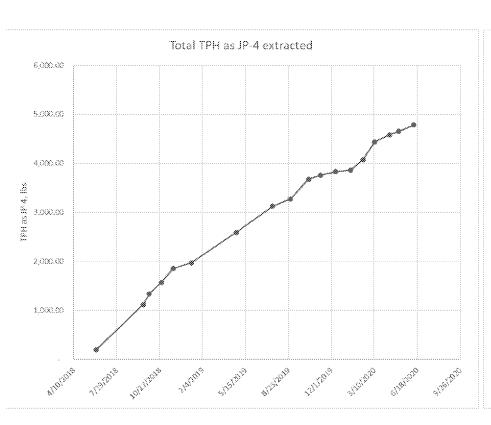


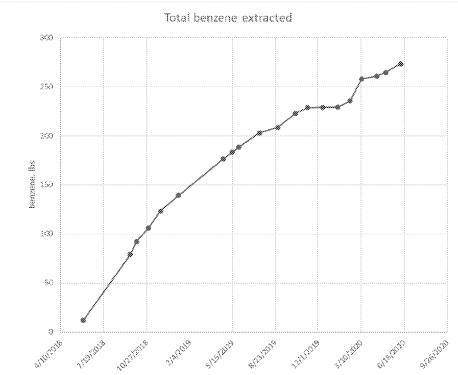
Overall Extraction Rates and Cumulative Volume Extracted





Estimated Mass Removal by Extraction







Site ST012 Sulfate Field Screening

		Sulfate Concentration (mg/L)															
Date	CZ02	CZ03	CZ05	CZ10	CZ13	CZ16	CZ18	CZ07	CZ20	CZ21	UWBZ15	UWBZ17	UWBZ21	UWBZ22	UWBZ24	UWBZ26	UWBZ27
11/5/2019	90						100		60	70			100		0	110	
11/12/2019								80		100	110			130		100	90
11/20/2019	120	140	20	240	0	210	650	3000	380	OFF	100	Mar con-com	20	0	700	600	480
11/26/2019	140						30		10	Off			Off		450	500	
12/3/2019								100		off	130			10		ERROR	350
12/10/2019	120						140		110	off			40		100	off	
12/17/2019								100	140	off	140			40		off	300
1/8/2020	130						145		140	off		140	50		100	off	
1/14/2020								130		off	20			Error00		off	40
1/21/2020	340					~~~	20		80	off		180	100		80	off	
1/27/2020								120		off	50			100		off	40
2/4/2020	400						90		120	off		210	140		80	off	
2/11/2020								100		Off	70			60		injecting	50
2/18/2020	300						80		100	off		100	100		1350	off	
2/25/2020								60		off	130	50		30		BioTrap	100
3/2/2020	300						70		80	off		60	80		1200	off	
3/10/2020								50		off	100	50		50		BioTrap	biotrap
3/17/2020	250						60		50	off		20	40		800	off	
3/24/2020						m w.m		60		off	80	30		40		BIOTrap	BioTrap
4/1/2020	220						40		40	off		10	20		400	off	
4/7/2020								10		off	140	50		20		BIOTrap	BioTrap
4/14/2020	60						0		40	off		70	90		40	off	
4/22/2020								10		Off	130	80		30		BIOTrap	BioTrap
4/27/2020	80						10		30	off		90	50		40	off	
5/5/2020								10		Off	100	90		40		BIOTrap	BioTrap
5/12/2020	70						0		10	off		70	20		30	off	
5/19/2020								20		Off	50	20		40		BIOTrap	BioTrap
5/26/2020	200						30		60	off		0	10		0	off	
6/3/2020								0		Off	20	20		40		BIOTrap	BioTrap
6/10/2020	150						20		40	off		10	10		0	off	
6/16/2020	~~~							error00		Off	450	Sulfate Injection		10		BIOTrap	BioTrap
6/23/2020	60						20		1800	off		10	60		0	1700	
7/2/2020										Off	450	0		10		1200	400
7/7/2020	50						0		1200	off		20	30		0	off	

Screening location is an extraction location

Screening location is a monitoring well

CZ18, CZ21, UWBZ22, UWBZ26, and UWBZ27 extraction shut down. Suspect field screening results in October and November not included



Site ST012 Sulfate Field Screening

***************************************								Sulfate	Concentra	tion (mg/L)								
Date	UWBZ28/LSZ51	UWBZ30	LSZ09	LSZ10	LSZ11	LSZ12	LSZ15	LSZ19	LSZ23	LSZ35	LSZ37	LSZ38	LSZ39	LSZ40	LSZ43	LSZ44	LSZ47	W30
11/5/2019	off	70	90	90		70			90		230	60	80	60				
11/12/2019		8 0	90	100					90		190	70		70			0	100
11/20/2019	OFF	OFF	790	470	120	2000	630	300	720	4030	400	2000	900	230	OFF	540	0	300
11/26/2019	off	off	65.0	350		600			off		530	460		90				100
12/3/2019		off	320	370	360				130		60	1060		200			0	-
12/10/2019	off	off	700	350		47 0			off		100	800	460	570				
12/17/2019		off	310	370	200				off		120	750		550			0	130
1/8/2020	off	off	300	410		350			off		100	770	450	520				160
1/14/2020		off	80	330	370				off		20	450		124			0	
1/21/2020	off	off	30	340		460			Z		70	320	230	680				
1/27/2020		260	4000	310	3530				off			210		660			500	200
2/4/2020	off		400	300		360			off		420	370	200	150				
2/11/2020		400	30	40	420	0			off			300		680			0	180
2/18/2020	off		50	80		220			off		430	240	160	500				
2/25/2020		440	40	240	440		an ne ne		off	an ne ne	~~~	Bio Trap	an ne me	700		40 NF NB	0	80
3/2/2020	off		40	250	~~~	200	an no na		off		400	Bio Trap	120	600				
3/10/2020		380	50		300				off			Bio Trap		490			0	70
3/17/2020	off	off		200		200			off		300	Bio Trap	Biotrap	430				
3/24/2020		360	50		200				off			Bio Trap		450			0	70
4/1/2020	off	off		120		150			off		200	Bio Trap	Biotrap	350				
4/7/2020		620	140		120				off			Bio Trap		200			0	20
4/14/2020	off	off		180		680			off		60	Bio Trap	Biotrap	760				
4/22/2020		590	120	210	130				off			Bio Trap		690			0	20
4/27/2020	off	off		200		600			off		80	Bio Trap	Biotrap	650				
5/5/2020		6000	110	200	100				off			Bio Trap		600			100	10
5/12/2020	off	off		170		600			off		100	Bio Trap	Biotrap	580				
5/19/2020		OFF	80	60	40				off			Bio Trap		530			80	0
5/26/2020	off	off		210		740			off		90	Bio Trap	Biotrap	900				
6/3/2020		off	100	180	20				off			Bio Trap		700			50	20
6/10/2020	off	off		160		750			off		70	Bio Trap	Biotrap	700				
6/16/2020		OFF	50	40	0				off			Bio Trap		400			20	0
6/23/2020	injection pipe	0		140		200			off		150	150	200	640				
7/2/2020		10	40	80	0				off			100		500			0	10
7/7/2020	off	off		50		300			off		120		200					

Screening location is an extraction location
Screening location is a monitoring well

UWBZ30, UWBZ28/LSZ51, LSZ09, LSZ23, LSZ37, LSZ38 and LSZ39 extraction shut down. Suspect field screening results in October and November not included

LSZ12 sulfate decreased



Site ST012 Path Forward Jul-Aug 2020

- Continue SVE
- Continue pump repairs as necessary
- Pilot Study Implementation
 - Continue extraction and treatment
 - Submit Pilot Study Implementation Report
 - Continue sulfate screening
 - Additional injections to replenish and expand sulfate distribution
 - UWBZ22 and UWBZ24
 - LSZ28 (continue pumping at LSZ43)
 - LSZ35 (continue pumping at LSZ11)
 - UWBZ23 (continue pumping at UWBZ30)
 - W37, LSZ45 (continue pumping at LSZ12)
 - Downgradient perimeter well sampling in late July

16 July 2020

Air Force Civil Engineer Center



2020 BCT
MEETINGS/CONFERENCE
CALLS SCHEDULE
DELIVERABLE TRACKING

BCT Conference Call 16 July 2020

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BCT GENERAL UPDATE AND ACTION ITEMS

BCT Conference Call 16 July 2020